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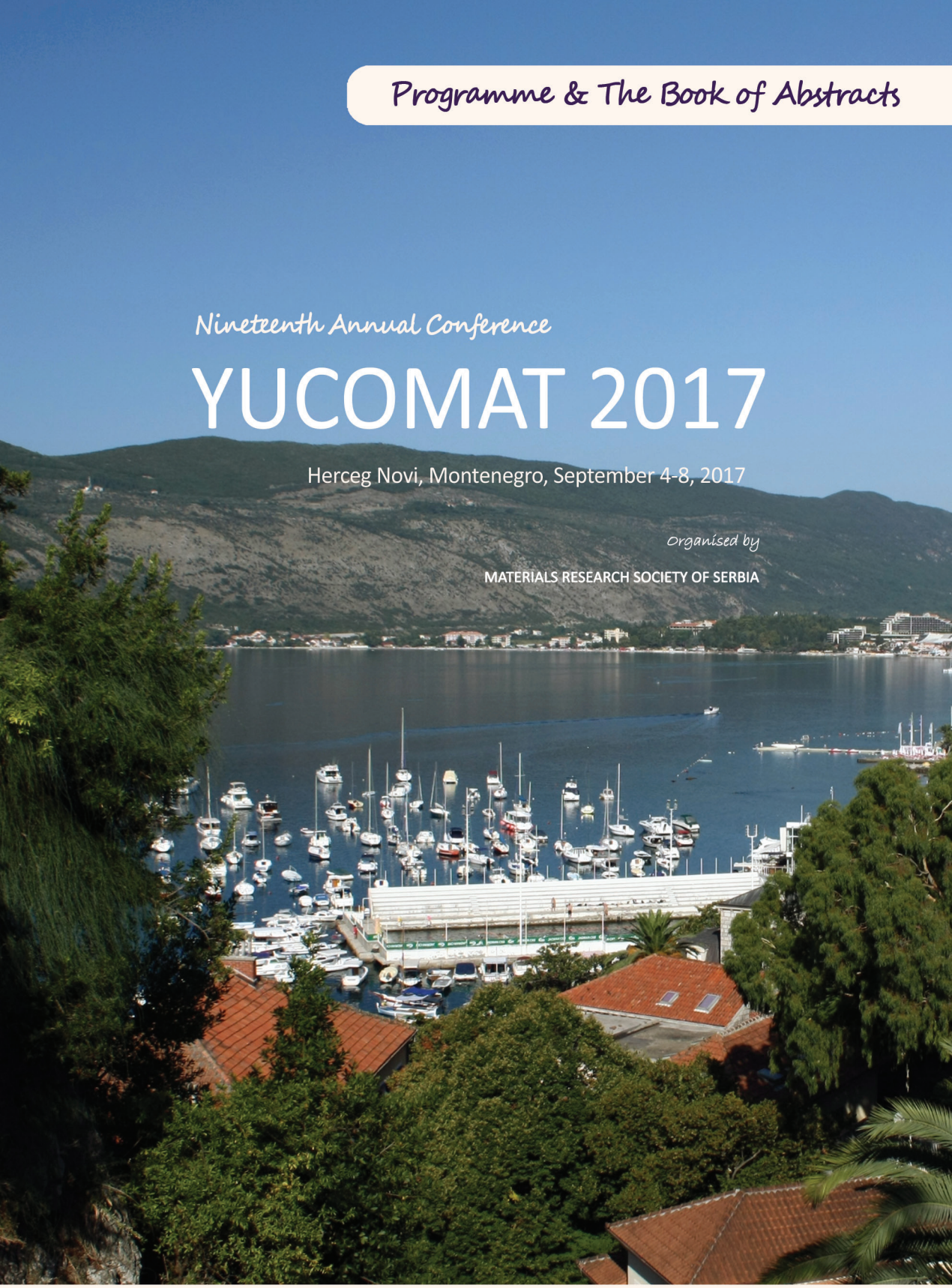

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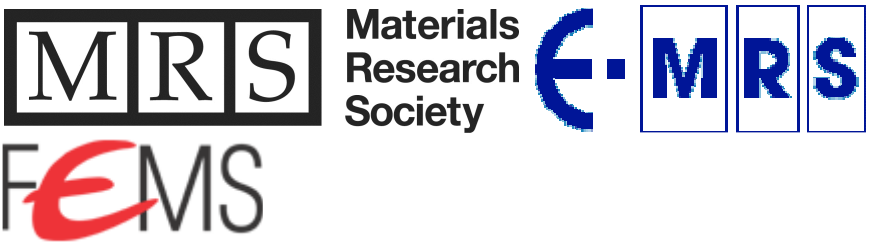

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Enhanced natural sunlight- and artificial UV-driven photocatalytic activity of mechanically activated ZnO/SnO_2 composite

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Over the past four decades there is an increasing interest to develop highly efficient semiconductor photocatalysts for degradation of organic and biological pollutants in water under light irradiation. The semiconductor band gap determines which wavelength of light will be absorbed; precisely, semiconductors with a wide band gap (> 3 eV) can absorb only UV light, while those with a narrow band gap (< 3 eV) can be activated by visible light.
In this study we examined structural, morphological, textural and optical properties of ZnO/SnO_2 composite as potential photocatalyst. Mechanical activation of commercial ZnO and SnO_2 powders has been used to produce a composite with high density of surface defects. To investigate the influence of thermal treatment on the physical properties, and consequently on photoactivity, the composite has been additionaly annealed at 400 and 700 °C. The phase purity, crystal structure and average crystallite size of pristine metal oxides and the composites were investigated by X-ray diffraction and Raman spectroscopy. The particles morphology and size distributions were studied by FE–SEM and laser diffraction particle size analyzer, respectively. The textural properties were determined from N¬2¬ adsorption/desorption experiments, while the optical properties were studied using UV–Vis diffuse reflectance and photoluminescence spectroscopy. Photocatalytic activity of pristine ZnO and ZnO/SnO2 composites were examined via de-colorization of methylene blue under: (1) direct natural sunlight, and (2) artificial UV irradiation. In both cases enhanced photocatalytic activity of ZnO/SnO_2 has been found. Enhanced photocatalytic activity can be attributed to the surface defects and to created ZnO/SnO_2 heterojunctions which reduced electron-hole recombination time.

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